

What Is Claimed Is:

1. A method for manufacturing an R-Fe-B rare earth magnet, comprising the steps of:

- a. preparing rare earth alloy powder having an oxygen content in a range of 50 wt. ppm to 4000 wt. ppm and a nitrogen content in a range of 150 wt. ppm to 1500 wt. ppm;
- b. compacting the rare earth alloy powder by dry pressing to produce a compact;
- c. impregnating the compact with an oil agent from the surface of the compact; and,
- d. sintering the compact,

wherein the step of sintering the compact includes:

a first step of retaining the compact at a temperature in a range of 700 °C to less than 1000 °C for a period of time in a range of 10 minutes to 420 minutes; and

a second step of permitting proceeding of sintering at a temperature in a range of 1000 °C to 1200 °C, and

the average crystal grain size of the rare earth magnet after the sintering is in a range of 3 μ m to 9 μ m.

2. A method for manufacturing an R-Fe-B rare earth magnet according to claim 1, wherein the step of preparing rare earth alloy powder includes milling an alloy material in a nitrogen gas atmosphere having an oxygen concentration of 5000 wt. ppm or less and nitriding the surface of milled powder.

3. A method for manufacturing an R-Fe-B rare earth magnet according to claim 1, wherein the average particle size of the rare earth alloy powder is in a range of 1.5 μ m to 5.5 μ m.

4. A method for manufacturing an R-Fe-B rare earth magnet according to claim 1, wherein the oil agent includes a volatile component.

5. A method for manufacturing an R-Fe-B rare earth magnet according to claim 4, wherein after the step of impregnating the compact, the temperature of the compact is at least temporarily reduced due to the volatilization of the oil agent.

6. A method for manufacturing an R-Fe-B rare earth magnet according to claim 1, wherein the oil agent comprises a hydrocarbon solvent.

7. A method for manufacturing an R-Fe-B rare earth magnet according to claim 1, wherein prior to the step of compacting the rare earth alloy powder, a

lubricant is added to the rare earth alloy powder.

8. A method for manufacturing an R-Fe-B rare earth magnet according to claim 1, further comprising the step of removing the oil agent substantially prior to the step of sintering the compact, and after the step of removing the oil agent, the compact is kept away from contact with the atmosphere until completion of the step of sintering the compact.

9. An R-Fe-B rare earth magnet, having an average crystal grain size in a range of 3 μ m to 9 μ m, an oxygen concentration in a range of 50 wt. ppm to 4000 wt. ppm, and a nitrogen concentration in a range of 150 wt. ppm to 1500 wt ppm.

10. A method for manufacturing an R-Fe-B rare earth magnet, comprising the steps of:

a. preparing rare earth alloy powder having an oxygen content in a range of 50 wt. ppm to 4000 wt. ppm and a nitrogen content in a range of 150 wt. ppm to 1500 wt. ppm by embrittling an R-Fe-B rare earth alloy by hydrogen occlusion and milling the embrittled alloy;

b. compacting the rare earth alloy powder to produce a compact;

c. retaining the compact at a temperature in a range of 700 °C to less than 1000 °C for a period of time in a range of 10 minutes to 420 minutes and releasing

hydrogen outside the compact so that the amount of hydrogen contained in sintered magnet is in a range of 10 wt. ppm to 100 wt. ppm; and

d. sintering the compact at a temperature in a range of 1000 °C to 1200 °C, wherein the rare earth magnet after the sintering the rare earth magnet has an average crystal grain size in a range of 3 μ m to 13 μ m and a hydrogen content in a range of 10 wt. ppm to 100 wt. ppm.

11. An R-Fe-B rare earth magnet, having an oxygen concentration in a range of 50 wt. ppm to 4000 wt. ppm, a nitrogen concentration in a range of 150 wt. ppm to 1500 wt. ppm, and a hydrogen content in a range of 10 wt. ppm to 100 wt. ppm.

12. An R-Fe-B rare earth magnet according to claim 11, wherein the average crystal grain size is in a range of 3 μ m to 13 μ m.

13. An R-Fe-B rare earth magnet according to claim 11, wherein the R-Fe-B rare earth magnet is manufactured of a material obtained by embrittling an R-Fe-B rare earth alloy by hydrogen occlusion.

14. An R-Fe-B rare earth magnet, having an oxygen concentration in a range of 50 wt. ppm to 4000 wt. ppm, and a hydrogen content in a range of 10 wt.

ppm to 100 wt. ppm, wherein a rare earth element concentration is 32 wt. % or less of the magnet.

15. An R-Fe-B rare earth magnet according to claim 11, wherein a rare earth element concentration is 32 wt. % or less of the magnet.

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